Precision CMOS Clock Oscillator for HI-G Applications

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Abstract

Subject Terms

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Number of Pages
23

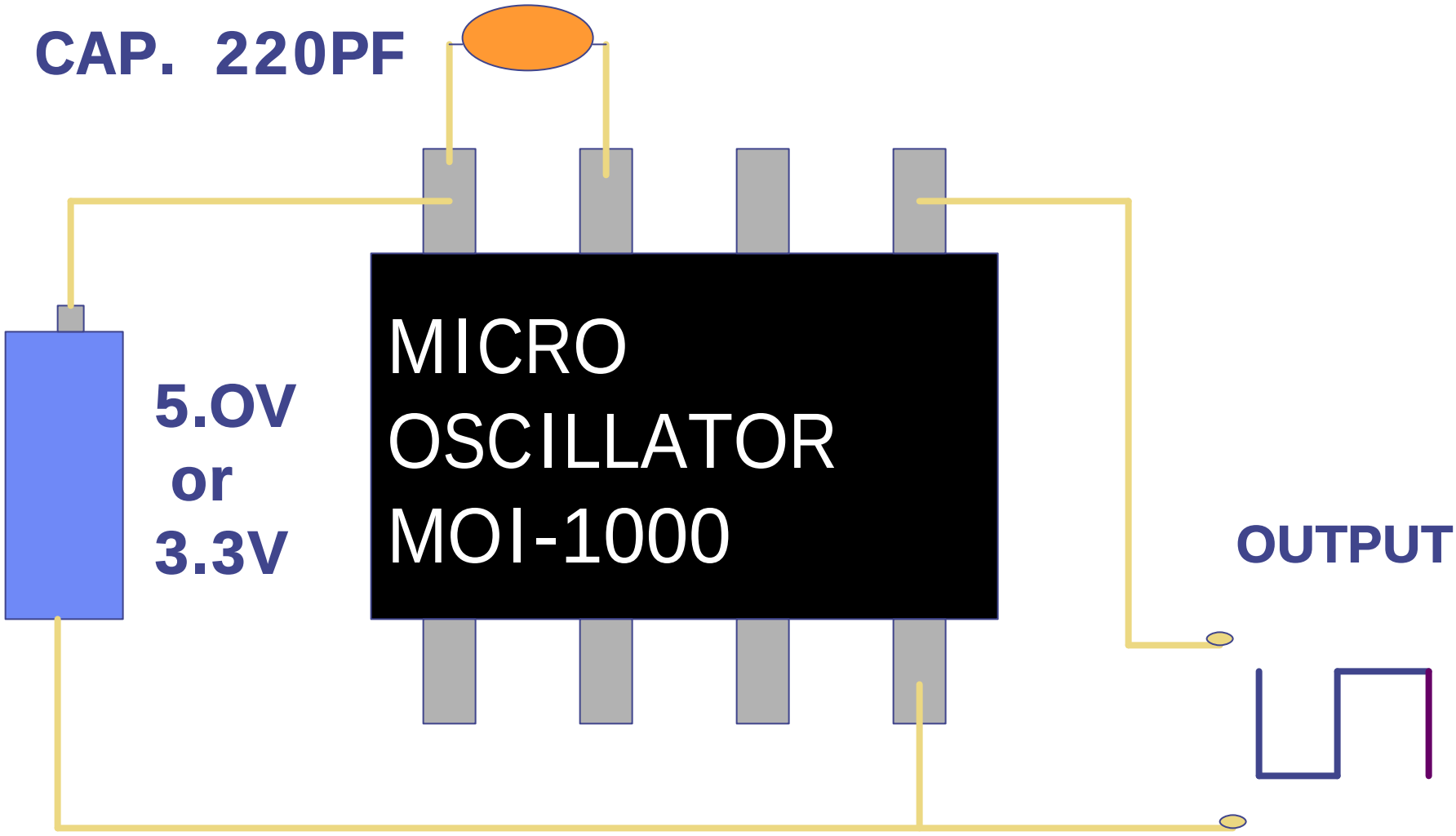
Summary of Discussion

- MOI-1000 CLOCK OSCILLATOR
- COMPARISON OF OSCILLATOR TYPES
- SBIR AF98-220
- MOI-2000 CLOCK OSCILLATOR
- Proposed 32.7KHZ Oscillator
- Summary & Recap

MOI-1000 Clock Oscillator

- *Smallest*
- *Fastest Turn On*
- *Most Rugged*
- *Lowest Power*

OSCILLATOR CIRCUIT

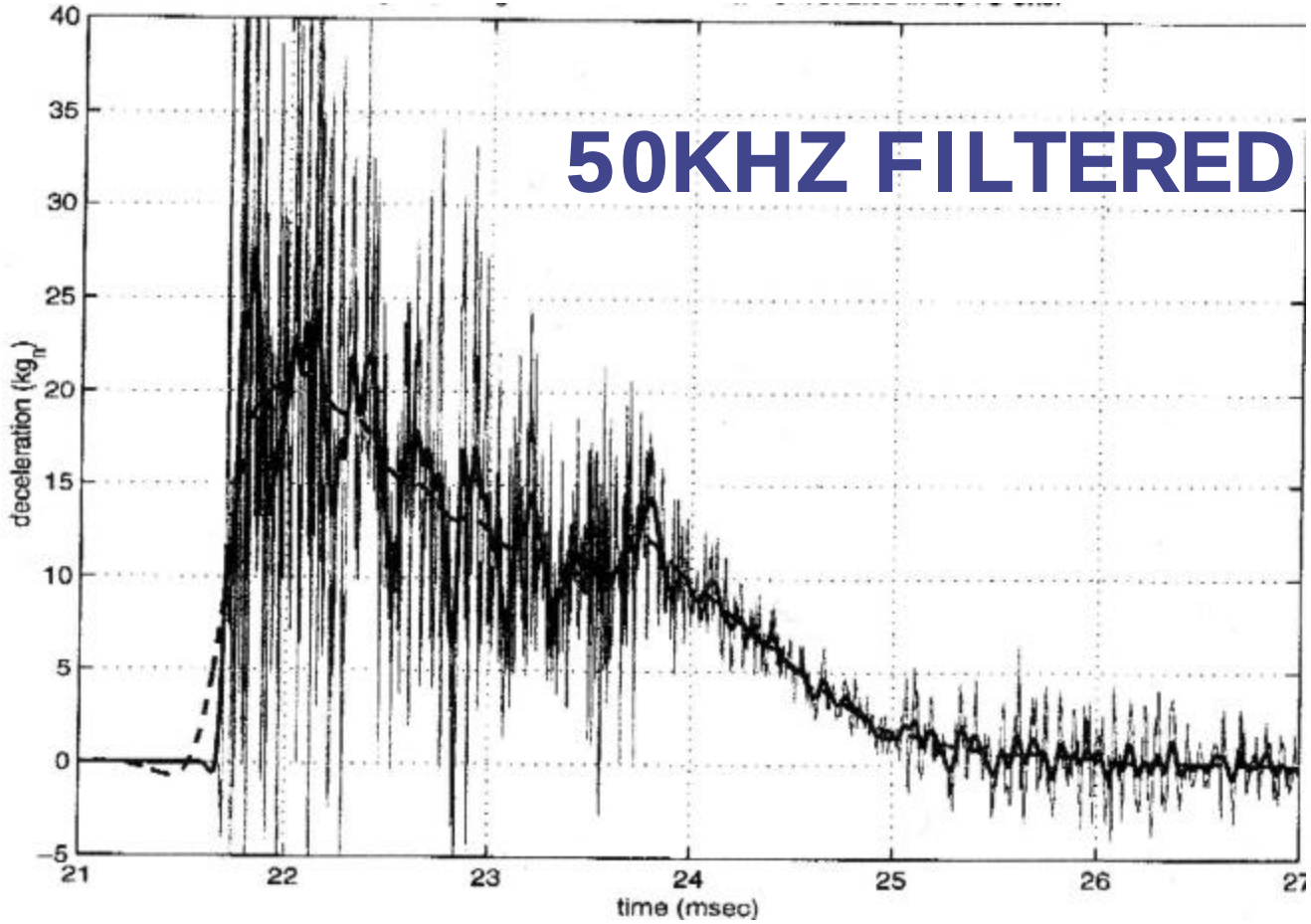


MOI-1000 SPECIFICATION

CMOS IC

SIZE		1.7 X .9 MM
FREQUENCY		16, 20, 24 MHz
FREQUENCY ACCURACY (Temp. & Voltage, Etc.)		
INDUSTRIAL TEMP		0.5%
MILITARY TEMP		1.0%
OPERATING POWER	(5.0V)	25 mW
	(3.3V)	10 mW
OUTPUT, SQUARE WAVE SYMMETRY		55/45%
SHOCK, OPERATIONAL		> 80,000 G
PACKAGE		SO-8, MSO-8 or Bare Die

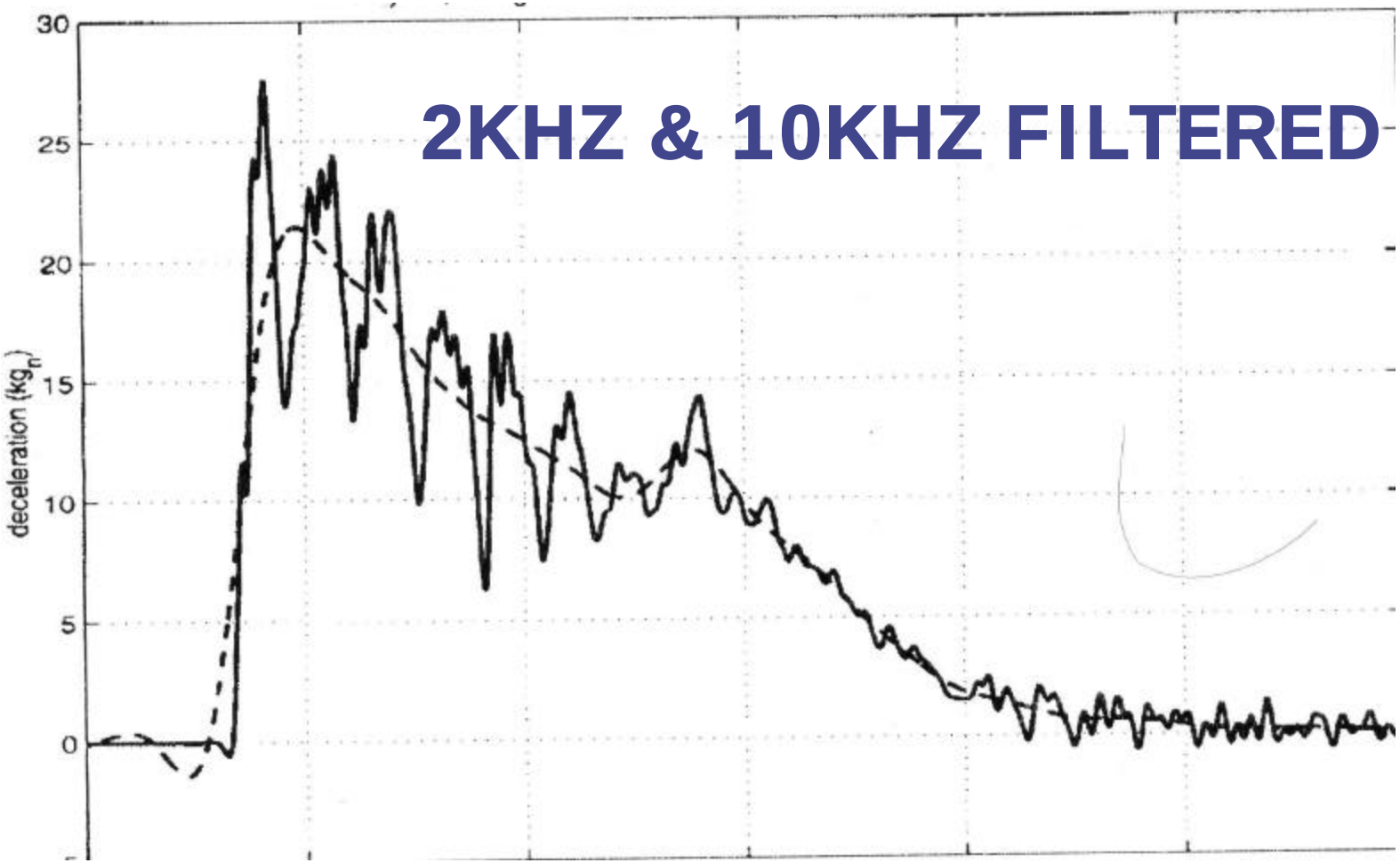
MOI-1000 ACELERATION TEST (UNIT OPERATING)



155 MM HOWITZER, CONCRETE WALL

PLOT CURTESY OF AFRL/MNMF

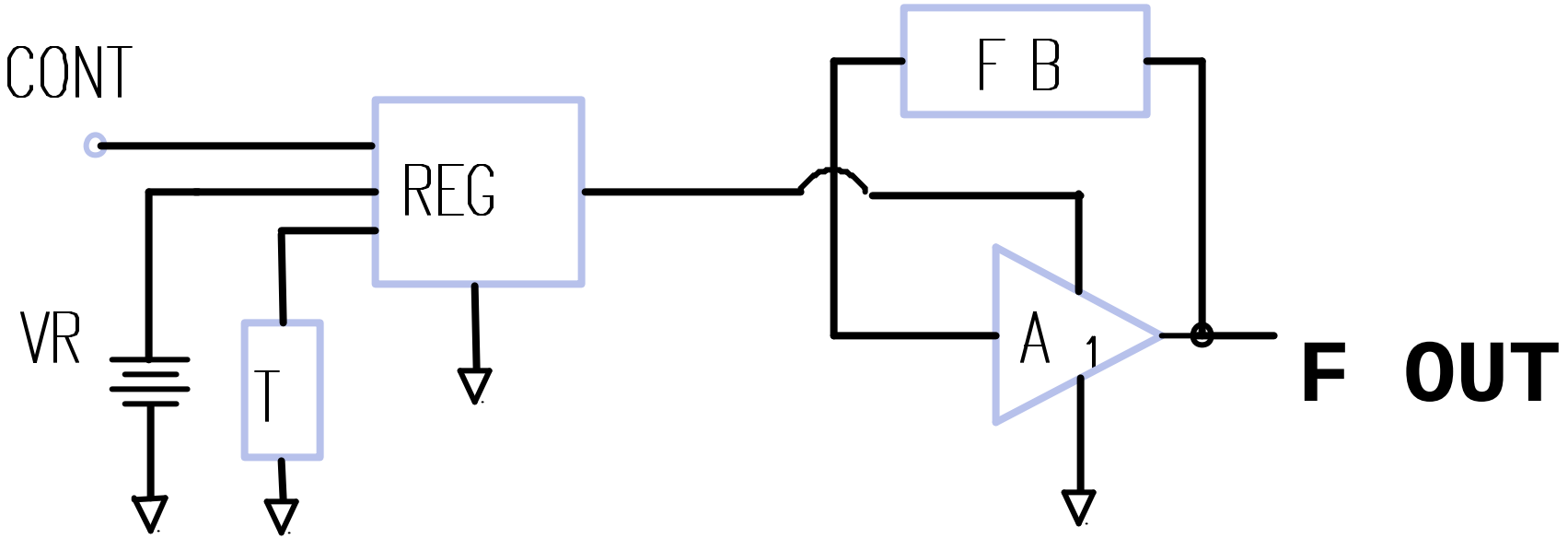
MOI-1000 ACELERATION TEST
(UNIT OPERATING)



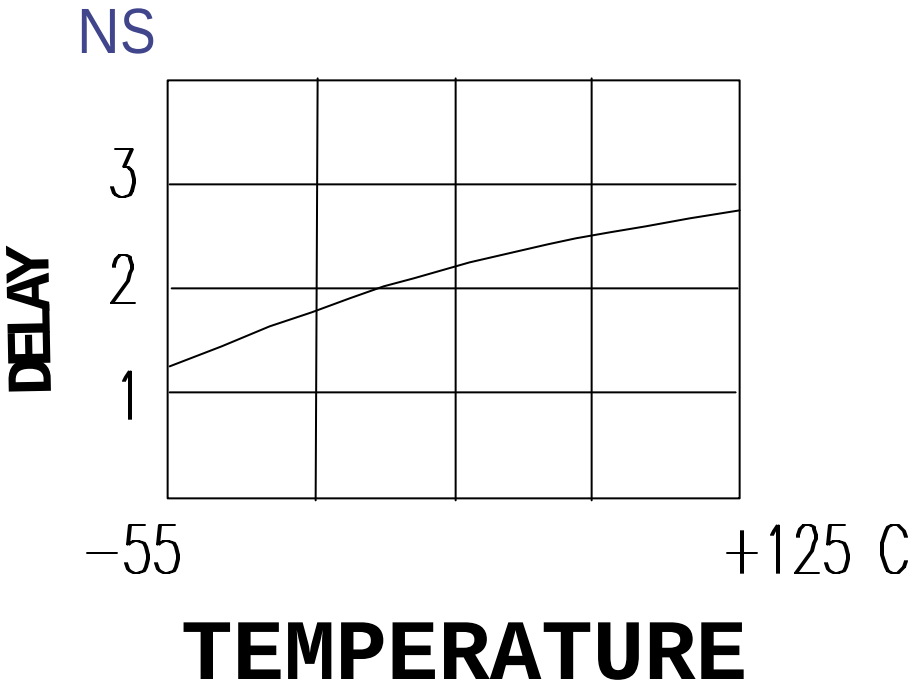
155 MM HOWITZER, CONCRETE WALL

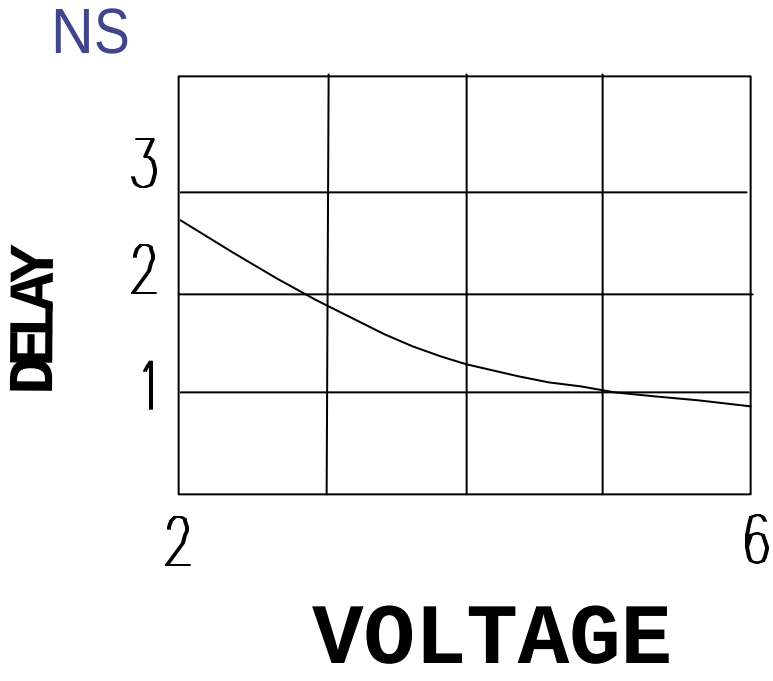
PLOT CURTESY OF AFRL/MNMF

MOI-1000
CLOCK OSCILLATOR
SYSTEM BLOCK DIAGRAM



PROPAGATION DELAY TIME VARIATIONS





CLOCK OSCILLATOR COMPARISON CHART

	MICRO OSCILLATOR	CRYSTAL CLOCK	CERAMIC RESONATOR
FREQ. TOL.	MEDIUM	HIGH	MEDIUM
SIZE (mm)	.9 x 1.7	5 x 7	2.8 x 6.5
HYBRID	YES	NO	NO
RUGGEDNESS	VERY HIGH	LOW	MEDIUM

MOI-1000 ADVANTAGES

1: COMPLETE CLOCK OSCILLATOR
2: SMALL SIZE, BARE DIE OR S0-8
3: NO START UP PROBLEMS
4: NO FREQUENCY JUMPING
5: 3.3 V OR 5.0 V AVAILABLE
6: +/- 0.5% TOLERANCE INDUSTRIAL
7: +/- 1.0% TOLERANCE MILITARY

MOI-1000 DISADVANTAGES

1: NOT AS ACCURATE AS CRYSTAL

EXISTING APPLICATIONS

PROGRAMMAMBLE PROJECTILE FUZE

CRITICAL REQUIREMNENTS MET-

OPERATIONAL IN HIGH G ENVIRONMENT

FAST TURN ON TIME

BARE DIE FOR HYBRID PACKAGING

LOW OPERATING POWER

HARD TARGET FUZING

CRITICAL REQUIREMNENTS MET-

OPERATIONAL IN HIGH G ENVIREMENT

LOW OPERATING POWER

SBIR AF98-220

PURPOSES:

1) IMPROVE MOI-1000:

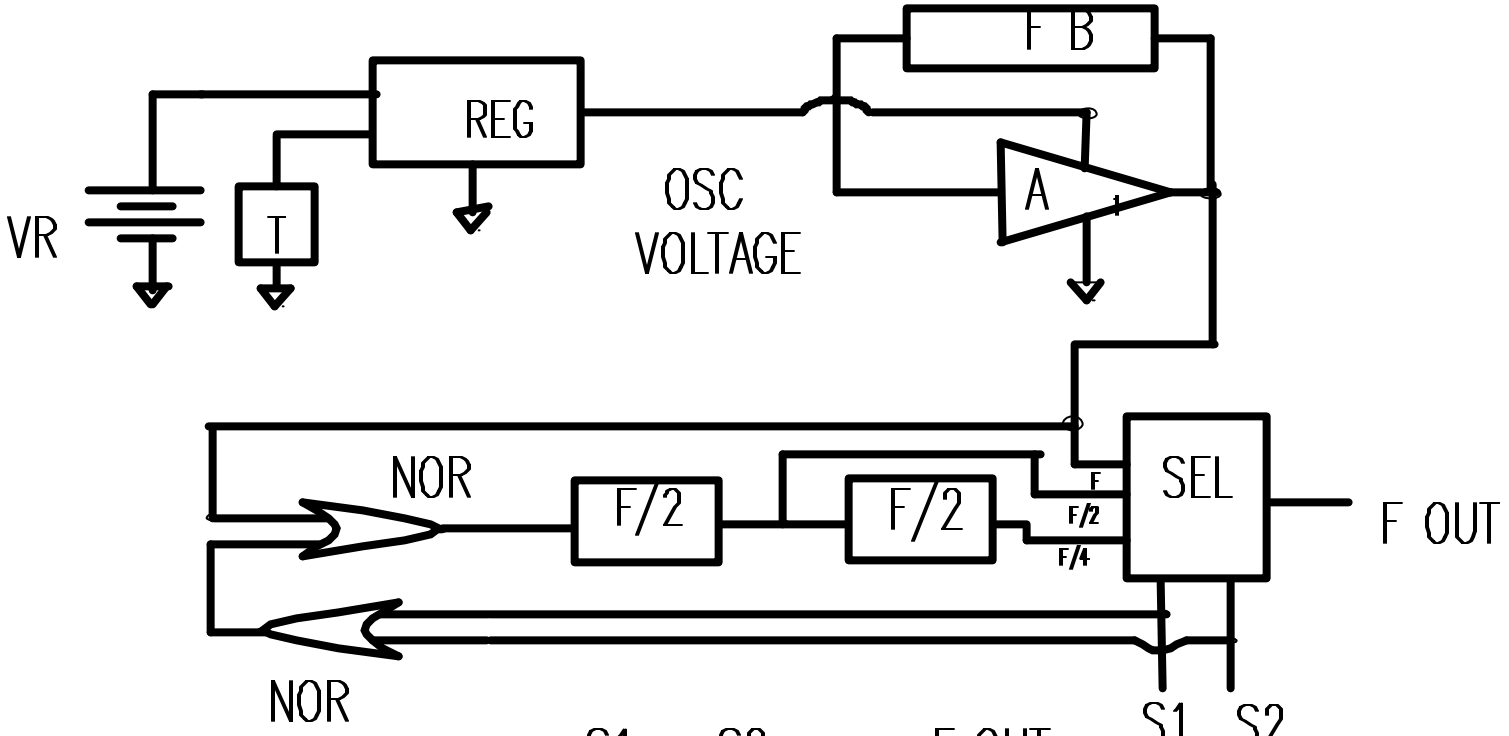
REDUCED OPERATING POWER
WIDER FREQUENCY RANGE

2) DEVELOP 32.7KHZ VERSION

SBIR TIMER BASE SYSTEM SPECIFICATION

	SYSTEM 1	SYSTEM 2
VOLTAGE	5V +/-5%	3.3V +/-5%
CURRENT	1 MA MAX	1 MA MAX
FREQ. TOL.	+/-1% ABSOLUTE	+/-1% ABSOLUTE
FREQ. RANGE SINGLE FREQ.	14.0 TO 20.0 MHZ	3.5 TO 5.0 MHZ
OPERATING TEMP.	-55 TO 125 ^{0}C	-55 TO 125 ^{0}C
OUTPUT DRIVE	2 HC CMOS	2 HC CMOS

MOI-2000 CLOCK OSCILLATOR SYSTEM BLOCK DIAGRAM



S1	S2	F OUT
0	0	F
1	0	F/2
0	1	F/4

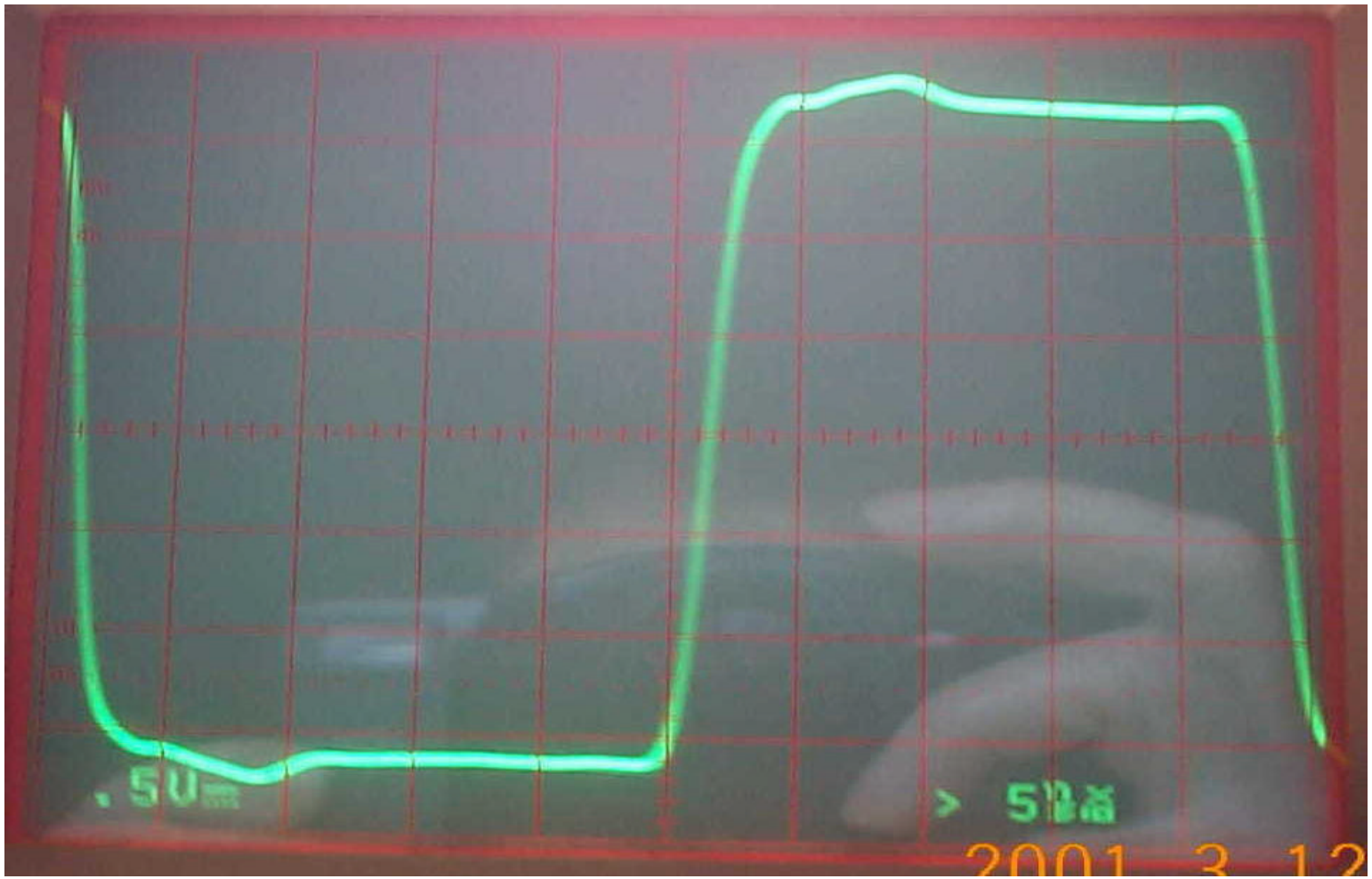
COMPARISON OF MOI-1000 TO MOI-2000

	MOI-1000	MOI-2000
FREQ.	14 to 24MHz	4 to 20 MHz
CURRENT		
5.0 VOLTS	5mA	1.6mA
3.3 VOLTS	3mA	1ma
TOL.	+/-1%	+/-1%

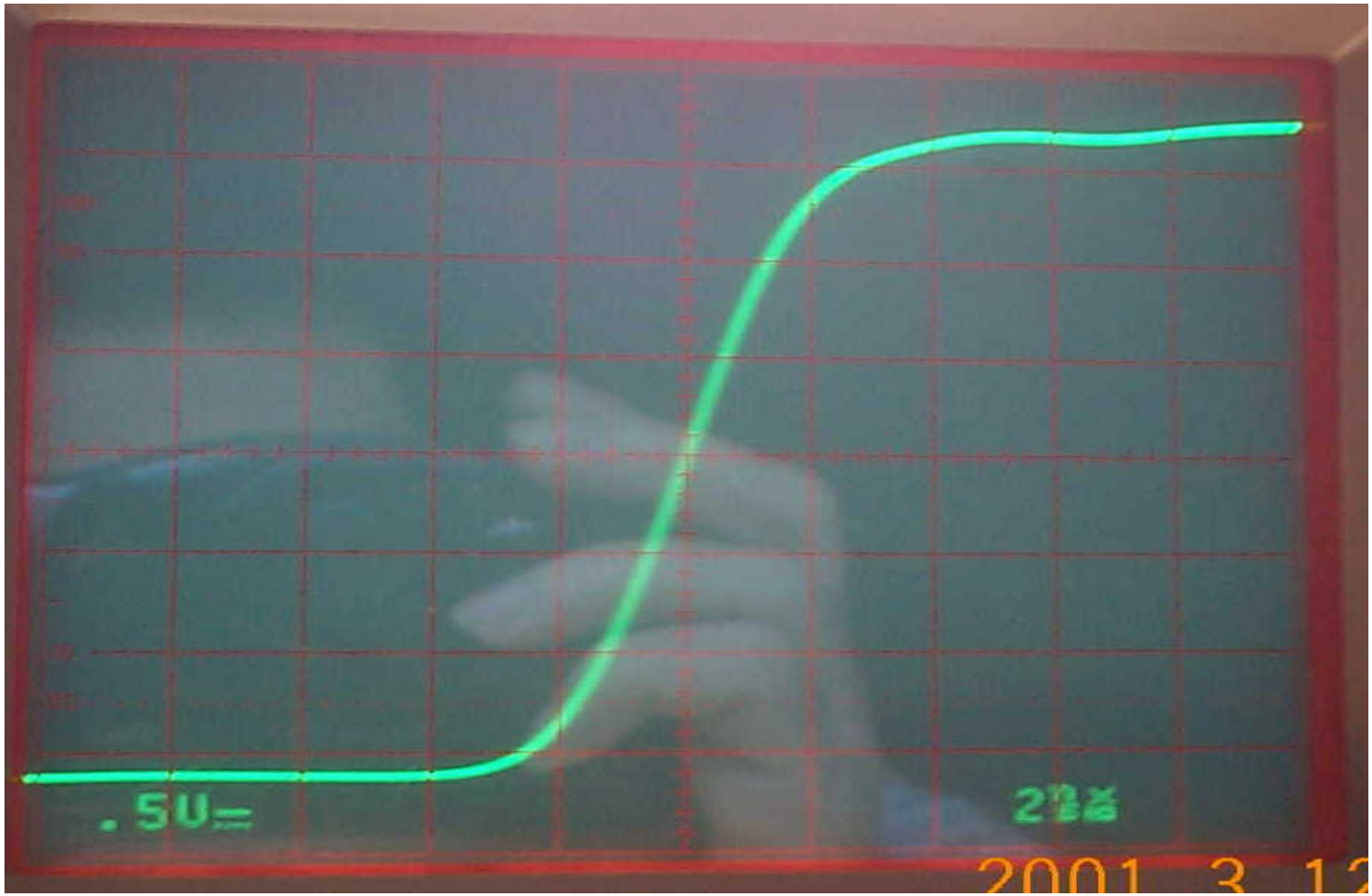
MOI-2000 PREPRODUCTION MEASURED PERFORMANCE

VOLTAGE	5	3.3
CURRENT	2.2 Ma	1.4 Ma
FREQUENCY	16 MHz	10 MHz
FREQ. TOL. -55 - 125^{o}C	± 1.0%	± 1%

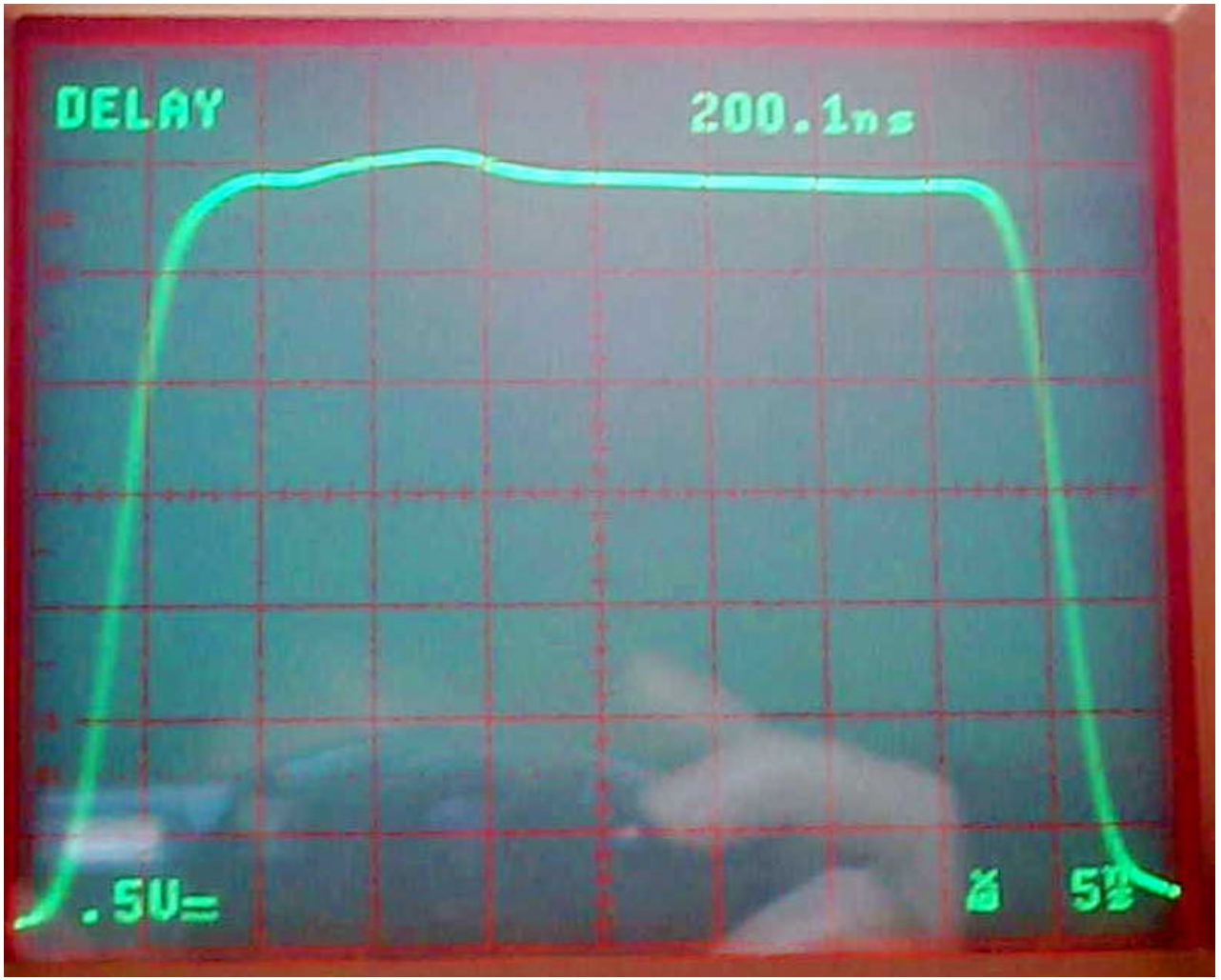
MOI-2000 OSCILLATOR OUTPUT
3.3V 12PF LOAD, 53/47% DUTY CYCLE



MOI-2000 OSCILLATOR OUTPUT
3.3V 12PF LOAD, 2 NSEC/DIV



MOI-2000 OSCILLATOR OUTPUT DELAYED 3.3V 12PF LOAD



32.7 KHz TIME BASE SYSTEM
SBIR SPECIFICATION

Operating Voltage	3.3v or 5V 5%
Operating Current	0.2 ma max
Frequency Tol.	+/- 1%
Frequency	32.7 KHz
Operating Temp.	-55 to 125 c
Package	S0-8

OSCILLATOR AVAILABILITY SCHEDULE

MOI-2000	
5V	JULY 2001
3.3V	NOW
32 .7KHz	JULY 2002

Summary & Recap

MOI-1000

5 YEARS OF PROVEN PERFORMANCE IN HI-G APPLICATIONS

MOI-2000

SAME PROVEN TECHNOLOGY AS MOI-1000 AT A MUCH LOWER OPERATING POWER LEVEL